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UNDERSTANDING ACCOUNTING CHANGES IN AN EFFICIENT MARKET: EVIDENCE OF DIFFERENTIAL REACTION

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#438

College of Commerce and Business Administration
University of Illinois at Urbana-Champaign

FACULTY WORKING PAPERS

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October 3, 1977

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Revised August, 1977

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*The authors are indebted to Craig Maisel for assistance in data collection. An early draft of this paper has benefited by comments of participants in workshops at several universities and by detailed comments communicated to the authors by two anonymous referees, and by Tom Dyckman, Nick Gonedes, Shyam Sunder and Mark Wolfson. We are grateful to everyone who took the time and interest to provide us with comments; unfortunatley the list of names is too long to write here.

UNDERSTANDING ACCOUNTING CHANGES IN AN EFFICIENT MARKET: EVIDENCE OF DIFFERENTIAL REATION

ABSTRACT

Using an experimental and control samples, we evaluated the joint effect of two factors on the behavior of common stock prices. These factors were (1) the decision to switch the method of costing inventory to LIFO, and (2) the sign of the expected growth in EPS before the announcement of the change was made. Our findings appear to support the hypothesis that the decision to change accounting method of costing inventory to LIFO is given different interpretation by the securities market, depending on the sign of expected growth in EPS. The significance of the joint effect of the two factors and the existence of differential reaction to the accounting change suggests that intervening variables mediate between accounting-based information and the securities market processing of the signals provided by such information. Different intervening variables may alter the interpretation of the same accounting event.

The acceptability of alternative accounting methods for measuring and reporting similar events has created certain types of problems in understanding accounting information. Present generally accepted accounting principles permit a firm's management to use different methods of costing different inventory items and to continue having the option of changing from one acceptable method to another, provided that the auditor expresses his opinion on the preferability of the adopted method. Only recently have accountants given explicit recognition to the resource allocation implications of accounting changes. APB Opinion No. 20 provided some structure and consistency for reporting accounting changes and, in the meantime, research in the area has taken a different role by addressing the economic consequences of accounting changes.

Our objective in this paper was to examine the joint effect of accounting changes and other variables on rates of return on investment in common stocks. For the independent variable we used the joint interaction between

expected performance of the firm and the accounting change in the method of costing inventory to LIFO, while the behavior of security rates of return about the period of the announcement of the accounting change was used as the dependent variable. This study, therefore, is an extension of the earlier work on the association between stock prices and accounting variables, in general, and of the studies reported by Sunder [1973] [1975], in particular. As in other studies we are not testing for the efficiency of the securities market; rather we accept the information-efficiency of the market as a maintained hypothesis underlying all of our analysis.

As detailed below, the findings of this study are quite important for two reasons: (a) differential and opposite reaction to the switch to LIFO was found to be dependent on, and consistent with, the direction of predicted change in earnings per share (EPS, hereafter); and (2) after isolating the interaction between the two variables, the effects of the switch to LIFO on security prices became statistically insignificant. Hence, the particular association between securities' rates of return and accounting change appeared to be conditional on other joint signals.

Prior Evidence and Problems

Researchers have developed a dichotomous classification for the research dealing with the association between accounting changes and security prices; the classification depends on whether or not an accounting change results in a substantive economic consequences for the operations of the firm. In summarizing the empirical evidence available through 1974, Gonedes and Dopuch [1974, p. 91] wrote:

> Summing up, the results of the above studies are consistent with the statements that the capital market does distinguish between accounting changes that appear to be reporting changes of no economic importance and those that appear to have substantive economic implications.

The studies that were reviewed, however, consisted of one article by Sunder [1973] that dealt with an accounting change that has substantive economic consequences and many others that dealt with accounting changes that have no direct economic impact on the operations of the firm. In a subsequent article, Sunder [1975] used the data of the first study and adjusted for possible changes in systematic risk before concluding [1975, p. 314]:

> The results support the hypothesis that the changes in market price of stocks are associated with the change in the economic value of the firms rather than changes in reported earnings.

In reviewing these studies, one might be inclined to agree with Kaplan [1974, p. 133] that it is gratifying "to find that companies switching to LIFO were not penalized by below-average performance of their common stocks." However, the scarcity of research studies dealing with accounting changes that have substantive economic implications does not reduce our uncertainty about the quality of these generalizations. In addition, we feel that the research method has not been refined to the extent of being capable of producing these generalizations. Three important reasons bear on this matter:

1. There have been few studies that have considered the joint effect of accounting information on stock prices [Gonedes, 1975 and Griffin, 1976 are exceptions, but none of the studies on accounting changes had dealt with such effects].
2. Rarely did the authors test for the statistical significance of the differences between the behavior of security prices conditional on accounting changes against those unconditional on any non-random event. Few exceptions include Kaplan and Roll [1972], Gonedes [1975] and Harrison [1977].
3. Generally, samples used in those studies were cross sectional without any other control sample [again exceptions include Gonedes and Harrison].[1]

Although this aspect has been relatively neglected, it is indeed an important element in evaluating the validity of the research if one is to attempt to attribute an economic meaning to the association between accounting events and security prices.[2]

These considerations have assisted us in identifying[3] two basic implications for our research design:

a. Any economic interpretation of the association between accounting signals (or data) and rates or return on investment in common stocks cannot be inferred on reasonable grounds unless there is strong control on the manipulation of the independent variable, accounting change. That is, a comparison between an experimental or treated sample with a control or non-treated "twin-like" group may assist in elevating the analysis to a level beyond mere association.

b. Research on the association between accounting variables and rates of return on investment in common stocks assumed that everything else is kept constant. But, conditions do change and making this ceteris paribus assumption may reduce the motivation to evaluate accounting changes and other variables jointly. The choice of these other variables with which the accounting change may interact may vary from one situation to another; our choice is discussed below.

Objective and Method

As in Sunder [1973] [1975], the accounting change in the method of costing inventory to LIFO was chosen for this study, especially since the events of 1974 and 1975 provided a richer data base. In addition, we elected to use the expected growth in earnings per share as the other variable with which the change to LIFO is assumed to interact. The reason for this choice

may be explained by a reference to the impact of LIFO.[4] Since the switch to LIFO in an inflationary economy reduces reported earnings and increases cash flows, one of these variables can provide a logical choice for introducing various classifications into the set of firms making accounting changes. However, at the time of making the announcement, the accounting numbers of cash flows and earnings per share for the year of the change are usually available only in a forecasted form. Furthermore, forecasted earnings per share assumed more relevance after the results of studies by Foster [1973], Gonedes, Dopuch and Penman [1976], and Patell [1976] have shown that some types of adjustments in security prices follow the disclosures of forecasted earnings. An additional evidence is provided here in Appendix C.

In order to classify the firms making accounting changes into homogenous groups with respect to earnings forecast as a joint variable, the following rule was adopted:

$$\text{Classify a switching firm (S) into } \begin{cases} \text{S+} & \text{if } [FEPS_{bs,ts} - AEPS_{ts-1}] > 0 \\ \text{S-} & \text{if } [FEPS_{bs,ts} - AEPS_{ts-1}] \leq 0 \end{cases}$$

where FEPS = forecasted earnings per share; AEPS = actual earnings per share, ts = the year of the change was made ; bs = forecasted earnings per share for the year of the change which was made before the announcement of the firm's decision to switch to LIFO.

This classification resulted in a disaggregation of firms making the change to LIFO according to the direction of expected change in EPS. This sign relation is similar, but not identical, to the one utilized by Ball and Brown [1968], which they called"forecast error." However, our choice introduced the joint interaction of signals which we wanted. Naturally, the existence of the joint interaction was a mere assumption whose validity

needed to be verified.

The second step was to design and select a control sample. We wanted to use a control sample which would simulate a twin-like group for the switching firms. We preferred to use pair-matching over a random sample for a simple, but important, reason--the dates of announcing accounting changes need to be preserved and consistently aligned between the firms making the change and their controls. Utilizing a random sample for control would have made this alignment of dates very arbitrary and would have rendered any statistical tests of significance of differences between them very difficult. The criteria adopted in selecting the control sample are discussed in the next section.

The control sample was also classified in the same manner as the switching (or experimental) sample, which resulted in a classification of these firms into C+ and C- for the firms with positive and negative expected change in earnings per share, respectively. However, the sign of expected change in earnings per share was not among the criteria used in selecting the control sample because this would have reduced the feasible set of firms significantly. Accordingly, not every S+ firm may be matched with a C+ control firm, and not every switching S- firm may be matched with a C- firm, which resulted in two more classifications for the control group only: CS+ for the matched pair of S+ and CS- for the matched pair of C-. This classification may be presented as follows:

Exhibit One
Levels of Factors Used in the Study

Factor B *	Factor C *	Factor A	
		Switch	Control
+	+	S+	C+
+	-	S+	C-
-	-	S-	C-
-	+	S-	C+

*Factor B = the sign of forecasted change in EPS for the switch firms.
*Factor C = the sign of forecasted change in EPS for the control firms.

Based on this design, the principal objective of this study may be stated as evaluating the relative importance of the impact of the joint signal between switching to LIFO and the direction of expected performance of the firm on the prices of its common stocks. On the one hand, a significant joint effect would imply the existence of differential reaction to the switch to LIFO and that the market evaluates the decision to switch to LIFO differently in light of other factors. On the other hand, having no significant joint effect on security prices would provide no evidence that the market gives more than one interpretation to the firm's decision to switch to LIFO.

In order to render security prices useful for analysis, the market model was utilized to filter out the portion of variability in security prices which is attributable to market-wide factors. In addition, all data have been transformed to rates of return. The usual market model took the form:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + e_{jt}$$

where:

R_{jt} = rate of return on stock j for the month t and is equal to $(\text{price}_t + \text{dividends}_t - \text{price}_{t-1}) / \text{price}_{t-1}$.

R_{mt} = rate of return on the market protfolio (used Fisher's link relatives)

α_j = the intercept.

β_j = the measure of systematic risk = $\dfrac{\text{cov}\,(R_{jt}, R_{mt})}{\text{Var}\,(R_{mt})}$

e_{jt} = a residual, where $E(e_{jt}) = 0$; $E\,(e_{jt}, e_{jt-s}) = 0$;

i = firms = 1, 2, ..., n.

t = month.

Estimation of the model and utilization of the residual term, e_j, in the analysis are presented in the sections that follow .

Sample Selection and Statement of Hypothe es

A list of all firms that had chang d the method of inventory valuation to LIFO in 1974 and 1975 was obtained from Di sclosure Journal, Index of Corporate Events. By comparing the date of filing the 8-k report with the SEC with respect to the change in accounting methods against the dates of announcing the change in the Wall Street Journal, we found that the filing date could lag as much as two months after the announcement of the decision to switch was made. As a result, only firms whose announcement dates were checked out in two sources were retained in the sample. In addition to the two sources already mentioned, the S & P Corporate Record was used for this purpose. Furthermore, a firm was retained in the sample if its forecasted earnings per share before the switch to LIFO can be obtained from S & P Earnings Forecaster or from S & P Stock Guide.[5] Finally, stocks with non-stationary measures of risk (unstable beta) were eliminated (the nature of the test of non-stationarity used in this study is shown in Appendix A).[6] This process resulted in a sample of 107 firms that had switched to LIFO in 1974-75 whose announcement dates had been verified and whose systematic risk measures were found stationary over time. The sample consisted of 76 firms in S+ group and 31 firms in the S- group. Table 1 contains descriptive statistics on the distributional properties of the ti of the announcement of changing accounting methods.

Since the sample was not randomly selected, other variables were not randomized and a matched pair control sample was selected. Four criteria were used in pair-matching:[7] (1) Firms in the control sample have not changed accounting methods in 1974-5. (2) A control firm must be in the same industry of the switch firm with w it is to be paired. For this reason, at least a two-SIC digits were used when no reasonable candidate in the three digit classification was found. (3) The control firm must have a stable systematic risk measure (beta). (4) Finally, from among the feasible set, the chosen control stock should be that stock whose measure of systema risk is the closest to the systematic risk of the switch firm.

Table 1

Distribution of Month "0" for
Firms in Each Sub-Sample

		1974							1975		
		March	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
Switch	+	1	2	2	4	13	13	18	17	5	1
	-	0	1	1	4	4	4	6	7	4	0
	Total	1	3	3	8	17	17	24	24	9	1
Control	+	1	2	3	5	12	15	19	21	6	1
	-	0	1	0	3	5	2	5	3	3	0
	Total	1	3	3	8	17	17	24	24	9	1

Table 2

Distribution of the Magnitude
of Beta Per Sample

	Range of Beta										
	0.3 - .5	0.51 -0.6	0.61 -.7	0.71 -0.8	0.81 -0.9	0.91 -1.0	1.01 -1.1	1.11 -1.20	1.21 -1.3	1.31 -1.5	1.51 -1.8
Switch	[illegible]	1	6	15	17	23	9	13	6	7	3
Control	5	2	9	14	10	21	13	13	9	4	7

Mean Beta for the switch group = 0.952
Mean Beta for the Control Group = 0.985

This matching process required that the market model be estimated for all securities included on the CRISP tape using monthly rates of return for 1966-75 period and that the test for the stationarity of the market model parameters (using ANCOVA, see Appendix A) be applied to each estimate. In Appendix B, the samples selected for the switch and control firms are shown with the disclosure of the sign of the direction of expected or forecasted change in earnings per share and the F ratios for evaluating the significance of the stability of both parameters (alpha and beta) of the market model. Table 2 summarizes the extent of the similarity of betas between the switch and control samples.

After selecting the samples, the market model was re-estimated for each of the 107 switching firms and for each of the 107 control firms using the ten-year data base after excluding a 16 month period consisting of 12 months before the announcement, the announcement month, and three months after the announcement. For each control firm, a 16 month period was selected to correspond to the 16 month period of the switch firm with which the control firm was pair-matched. Since the samples selected contained only stocks with stable market model parameters, the estimates of alpha and beta were plugged in for each of the 16 month period around the announcement date in order to estimate residuals. This resulted in several types of information that were useful in hypothesis testing.

In order to state the hypotheses, let S be the decision to switch to LIFO and be a symbol designating the signal conveyed, F represents the expected or forecasted sign of growth in earnings per share which can assume a "+" or a "-" sign, j = the particular stock, and t = the month, which goes from -12 to +3. The estimates of the model took the following two conditional forms:

$$(R_{jt} \mid S,F) = \alpha_j + \beta_j R_{mt} + e_{jt} \mid S,F \qquad \text{(for the switch group)}$$

and

$$(R_{jt} \mid C,F) = \alpha_j + \beta_j R_{mt} + e_{jt} \mid C, F \qquad \text{(for the control group)}$$

If we further define : $CR_i = \sum_{t=-12}^{i} \sum_{j=1}^{N} e_{jt}$ and $CAR_i = \frac{1}{N} CR_i$, where i could be any month between -12 and +3, then the null hypotheses to be tested in this paper may be stated as follows (s.l. = significance level)[8] :

$H_{0.1}$: The announcement to switch to LIFO was not significantly associated with residual rates of return on investment in common stocks.

That is:

$$\text{Prob}((CAR_{S,F}) = (CAR_{C,F})) > \text{s.l.}$$

$H_{0.2}$: The covariability (interaction, or joint effect) of the residual rates of return on investment in common stocks between the direction of expected growth in EPS and the decision to switch to LIFO was not significantly different from random.

That is:

$$\text{Prob}((\text{Cov}\ (CAR_{jt}|S \text{ and } CAR_{jt}|F) = 0) > \text{s.l.}$$

Testing and Results

The essential feature of this study lies in its evaluation of the joint effect of the accounting change to LIFO and the forecasted sign of the expected growth in EPS on the return on investment in common stocks. In order to analyze the relative strength of this interaction component and to test for the stated null hypotheses at once, a factorial analysis of variance (ANOVA) was utilized with factor A being the decision to switch or not to switch to LIFO, factor B being the direction of forecasted growth in EPS for the switch firms, and factor C being the direction of forecasted growth in EPS for the control firms. Each factor took two levels: "yes" or "no" for the first factor, positive or negative for each of the other two factors. The resulting 2x2x2 factorial followed the design shown in Exhibit One, which is an unorthogonal design with fixed treatments. The number of observations in each cell were as shown in Exhibit Two.

The dependent variable was the cumulative average of residuals of rates of return on investment in common stocks (CAR) of the firms included in the samples, where CARs

were obtained from the market model discussed early. Seventeen ANOVAs were run, one for each month in the test period. The results followed a consistent pattern and the findings of a representative seven month period are reproduced in Table Three. The seven month period consists of the month of the announcement, and each of the three months preceding and following the announcement.

Exhibit Two

Factorial Design and Number of Observations in Each Cell

Factor B	Factor C	Factor A: yes (switch)	Factor A: No (control)
+	+	64	64
+	-	12	12
-	-	21	21
-	+	10	10

The results of ANOVA analysis may be summarized as follows:

1. After isolating interaction effects, the main effect of factor A, the decision to switch to LIFO, was not statistically significant. The probability of significance varied from 0.23 to 0.93 for the entire test period.

2. Also after isolating the interaction effects, neither one of the main effects of factors B and C, the forecasted sign of growth in EPS, was statistically significant. The probability of significance varied from 0.32 to 0.56 for the test period.

3. The interaction effect between factors A and B was statistically significant at a level below 0.001. However, the interaction effects of factors A and C were not statistically significant at any reasonable level of significance, which suggests that factors C and B are different. That is, firms having the same expected sign of growth in EPS are representing different populations in the control group and the experimental sample. This explanation is a bit supported by the presence of a significant relationship between factors B and C, which does not have any other economic interpretation. The differences between these two groups and the practical infeasibility of matching the switch and control firms on the basis of the forecasted sign in EPS motivated the use of the 2x2x2 factorial in order to filter out these differences before testing for the main effects or other interaction effects.[9]

4. The strength of the significance of the joint effect of factors A and B was carried to the testing of the significance of the interaction effect of the three factors AxBxC.

Table Three

The Results of a Three Factor Analysis of Variance for
The Seven Moths Surrounding the Announcement of
the Change to LIFO

Month	Factors** Statistics*	A	B	C	AxB	AxC	BxC	AxBxC
-3	Mean Sum of Squares	0.01514	0.1167	0.00382	1.7614	0.0045	0.7277	0.18205
	F- Statistic	0.197	0.967	0.032	22.9	0.06	6.03	2.37
	Prob. of Significance	0.65	0.32	0.86	0	0.81	0.015	0.12
-2	Mean Sum of Squares	0.0242	0.0919	0.0125	2.4343	0.0035	0.554	0.353
	F- Statistic	0.31	0.77	0.11	30.95	0.045	4.65	4.49
	Prob. of Significance	0.58	0.38	0.75	0	0.83	0.034	0.036
-1	Mean Sum of Squares	0.0006	0.0456	0.0093	2.569	0.00135	0.854	0.383
	F-Statistic	0.0077	0.34	0.07	32.7	0.017	6.38	4.88
	Prob. of Significance	0.93	0.56	0.80	0	0.90	0.013	0.03
0	Mean Sum of Squares	0.0106	0.074	0.0005	2.623	0.0032	1.35	0.432
	F- Statistic	0.13	0.56	0.0003	31.6	0.004	9.12	5.7
	Prob. of Significance	0.72	0.48	0.95	0	0.95	0.003	0.02
+1	Mean Sum of Squares	0.036	0.116	0.0032	1.814	0.0125	1.019	0.21
	F-Statistic	0.42	0.84	0.0235	21.34	0.15	7.44	2.44
	Prob. of Significance	0.52	0.36	0.878	0	0.70	0.0075	0.12
+2	Mean Sum of Squares	0.081	0.0511	0.0045	2.23	0.0375	1.132	0.322
	F- Statistic	0.78	0.35	0.03	21.5	0.36	8.05	3.53
	Prob. of Significance	0.38	0.55	0.86	0	0.55	0.005	0.06
+3	Mean Sum of Squares	0.145	0.0487	0.00286	1.804	0.1677	1.403	0.304
	F-Statistic	1.46	0.345	0.02	18.12	1.687	9.94	3.06
	Prob of Significance	0.23	0.56	0.89	0	0.20	0.002	0.08

* Each F statistic has 1 degree of freem in the numerator and 103 degrees of freedom in denomenator.

** Factor A = The decision to switch or not to switch to LIFO
Factor B = The forecasted sign of growth in EPS of the switching firms, which was made prior to the announcement to switch to LIFO.
Factor C = The forecasted sign of growth in EPS of the control firms at the time corresponding to the month of the announcment of the switch for the firms with which they are paired.

The most feasible interpretation of these results is that the explanatory power of the accounting change to LIFO was significantly conditional on the direction of forecasted change or growth in earnings per share which was made prior to the time of announcing the switch and, after isolating the effect of the interaction between the accounting change and the forecasted sign, the association between the accounting event and the temporal behavior of the cumulative average of residuals disappeared. That is, isolating interaction effects has reduced the significance of the effect of each of the main factors, the switch to LIFO and the forecasted sign of growth in EPS.

The conditionality of accounting changes on forecasted direction of change in EPS advances the argument for the existence of differential reaction of the securities market to the switch to LIFO, which is an accounting change with substantive economic implications. The case of differential reaction can perhaps be clarified by a simpler and more conventional approach to research in security prices. Exhibits Three and Four chart the temporal behavior of cumulative average of residuals for six series: CAR S+, CAR C+, CAR CS+, CAR S-, CAR C-, and CAR CS-. Comparing the first three series in Exhibit Three suggests that the event of switching to LIFO conditional on positive forecasted sign for growth in EPS appears to be associated with rates of return above the market and above the rates of return on investment in stocks of a control sample of same industry membership and risk class (group CS+) and of another control sample of same forecasted sign of growth in EPS (group C+). Conversely, the three series shown in Exhibit Four suggest that the switch to LIFO conditional on negative forecasted sign of growth in EPS appears to be associated with rates of return on investment in common stocks below the rates of return earned on investment in common stocks of firms in the same industry membership and risk class (group CS-), and below rates of return on investment in stocks of another control sample of firms with negative forecasted change in EPS (group C-).

Exhibit Three
The Behavior of the Cumulative
Average Residuals for the S+
Group and its Controls

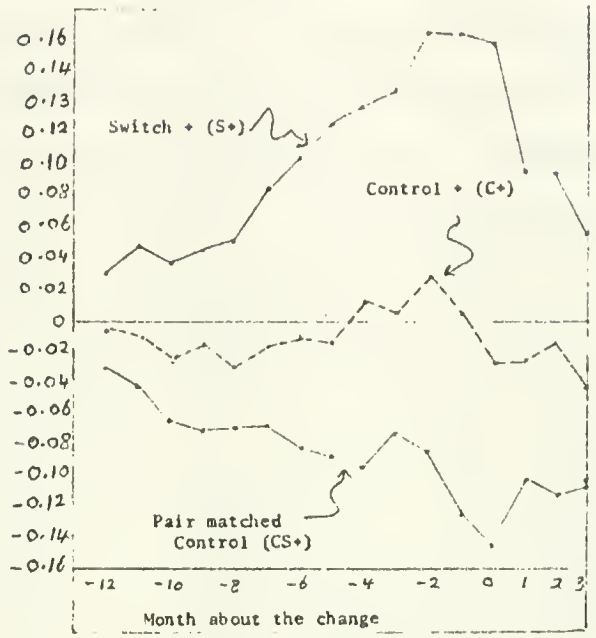
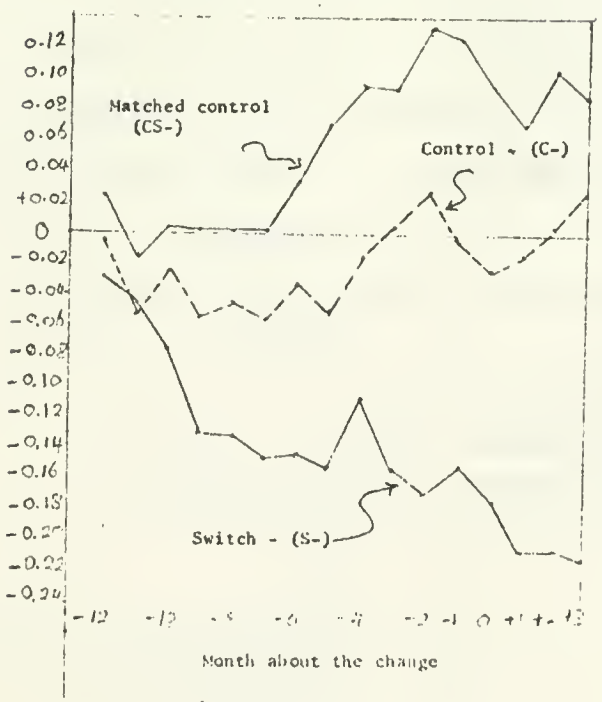


Exhibit Four

The Behavior of the Cumulative
Average Residuals for the S-
Group and its Controls

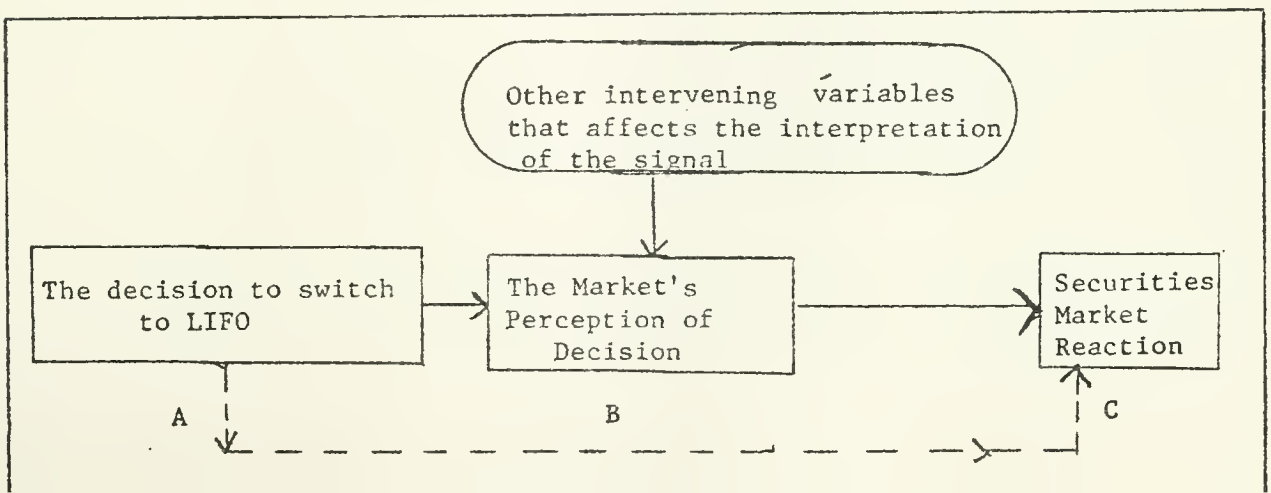


DISCUSSION

The impact of changing the method of costing inventory to LIFO was found to be signficantly conditional on the expected performance of switching firms. When the joint effect of the change signal and the direction of expected change in the performance of the switching firms was isolated, the decision to switch to LIFO had a highly insignificant effect on the variability of rates of return on investment in common stocks. Depending on the direction of expected performance of the firm, the decision to switch to LIFO appeared to have differential effects. This result adds a new dimension to the literature on the association between security rates of return and accounting information. In particular, there may be important intervening variables that in fact produce differential perception of the accounting change. For example, consider the relationship illustrated in Exhibit Five. The link between accounting signals and market reaction, denoted B, is observed to filter and interact with the decision to switch to LIFO. In prior research, accountants generally assumed that the market attributes one uniform meaning to a given accounting event, which would in effect reduce the value of the link B to a single code. In this paper, for example, the intervening variable was the direction of expected performance of the firm. There may be other variables that influence the market's perception of similar types of accounting information. For this behavioral property, we acknowledge both the lack and the

Exhibit Five

A Hypothesized Relationship of Intervening Variables



need for an explanatory theory.

In reaching the conclusions related to the differential reaction and the expected performance of the firm as a strong intervening variable, we have (1) used 107 firms that switched to LIFO and 107 firms of similar risk class and industry membership that did not switch to LIFO, where the latter group acted as a control since the former group was not randomly selected; (2) replicate the study with a smaller sample using a different data base and different computing packages; (3) used factorial designs to isolate the joint effects of interaction between the decision to switch or not to switch (for the control group) and the expectations formed about the performance of the operations of the firm; and (4) have used statistical tests in comparing residual rates of return on investment in common stocks of the switch and control firms.

From the evidence presented here, it is difficult to support the argument that the securities market evaluates the decision to switch to LIFO uniformly for all of the switch firms. Nor can it be claimed that the decision to switch to LIFO, which entails a substantial tax savings to a firm switching during an inflationary economy, is a sufficient condition to make the market revalue the common stock of the switching firm higher than its level before the change. As stated above, we hypothesized that the operation of intervening variables cause differential perception of the accounting change and, hence, the observed differential reaction. To repeat, the informational efficiency of the market has been accepted from the start as a maintained hypothesis and the findings of this research are not advanced to contradict a maintained hypothesis.

Footnotes

[1]Harrison's manuscript was made known to one of the authors during a workshop at Michigan State University where an early draft of this paper was presented. We would like to thank Dan Collins for directing our attention to the manuscript.

[2]In the language of research design, the observations constituting the test sample are experimental or "treated," and in order to clearly assign some causality between the treatement (in this case the treatment is the accounting change) and the dependent variable (in this case residual rates of return on investment in common stocks), all other variables must be theoretically kept under control. Randomization should provide such a control, but it is a fact that all experimental samples used in these studies were convenient samples selected on the basis of their availability and on being subject to the accounting change under investigation. Accordingly, such types of cross sectional data that were not randomly selected do not succeed in randomizing the effects of other exogenous and untreated variables that may in fact affect the behavior of the residual return. Since randomization is not accomplished, one would almost be forced to select a control sample that has properties similar to those of the experimental sample, except for the accounting change of interest to the researcher. In searching the literature, it is evident that none of the studies that dealt with accounting changes has in fact used control samples of the type suggested here, except for the manuscript by Harrison mentioned early and one article by Gonedes.[1975]

[3]We thank a referee for suggesting this method of presentation.

[4]In an inflationary economy the switch to LIFO will result in a tax saving and increase in the cash flow, but a decline in reported earnings, provided that (a) the switch to LIFO is made for tax purposes as well as for accounting purposes, (b) the inventory mix does not change in such a way to reverse the LIFO effect, (c) Lifo layers do not get liquidated, (d) Inflationary trends in the prices of items composing the inventory do not reverse, (e) tax rates and laws do not change in a way to nulify the effect of LIFO on earnings and cash flows.

[5]Standards & Poors Earnings Forecaster was utilized as a source for two reasons: (1) it is an accumulation of forecasts made by 61 firms in the financial area for over 800 firms and, hence, it is the most comprehensive source. And, (2) other researchers have found it to be reasonably accurate [see: Barefield and Comiskey, 1975].

[6]The test we used is for testing the stationarity of alpha and beta jointly.

[7]We contemplated using the sign of forecasted change in EPS as a criteria for matching, but this would have reduced the sample size to 64 and 10 in each group. However, we have analyzed the data related to these matched pairs as is reported in another footnote below.

[8]The hypotheses were stated in the null form to ease exposition. Also, alternative hypotheses were not presented in order to avoid redundancy.

[9] As we mentioned above, the pairs that would have been matched on the basis of the sign of forecasted change in EPS in addition to the above four criteria consist of 64 pairs of firms for the "+" group and 10 pairs for the "-" group. In this footnote we present the results of comparing the cumulative average of residuals of each group against its controls. We have used a paired t-test in order to eliminate the portion of the pooled variance which is due to the dependence between groups since the variance of the difference is equal to the sum of the variances minus twice the covariance. Hence, taking the differences between cumulative residuals of each pair would eliminate the dependence relationships between the pairs. This can be done because of equal sample size. The results of the t-tests are presented below:

Table F 9-1
Testing for differences between
matched pairs of S+ and C+

Month	Mean Difference	t-test	Prob. of Significance
-12	0.0069	0.37	0.71
-11	0.029	1.20	0.24
-10	0.0566	2.23	0.03
- 9	0.0826	2.605	0.011
- 8	0.0888	2.55	.013
- 7	0.0986	2.52	0.014
- 6	0.0986	2.52	0.014
- 5	0.118	2.94	0.0045
- 5	0.132	2.87	0.0056
- 4	.135	2.85	0.006
- 3	0.148	3.04	0.003
- 2	0.153	3.07	0.003
- 1	0.184	3.51	0.001
0	0.184	3.46	0.001
+ 1	0.144	2.65	0.01
+ 2	0.142	2.444	0.017
+ 3	0.144	2.58	0.0123

Table F 9-2
Testing for differences between
matched pairs of S- and C-

-12	-0.0919	-2.43	0.038
-11	-0.00887	-0.2	0.85
-10	-0.127	-1.38	0.20
- 9	-0.21	-1.58	0.15
- 8	-0.22	-2.08	0.066
- 7	-0.235	-2.1	0.064
- 6	-0.29	-2.1	0.065
- 5	-0.36	- 2.7	0.025
- 4	-0.314	-2.66	0.026
- 3	-.341	-2.31	0.05
- 2	-0.416	-2.62	0.027
- 1	-0.392	-3.07	0.0133
0	-0.39	-2.9	0.017
+ 1	-0.37	-2.73	0.023
+ 2	-0.452	-2.344	0.044
+ 3	-0.47	-2.38	0.04

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Appendix A

We have used analysis of covariance (ANCOVA) to test for the stationarity of the estimated parameters of the market model. For each firm in each sample (switch and control), the time series of the rates of return was partitioned into two equal sub-periods and three estimates of the market model were made. The first estimate used the sample information for the entire period of ten years, the second used the data for the first sub-period of five years and the last used the data for the last five years. The resulting sum of the squares of residuals may be denoted SST, SS1 and SS2 for the regressions of the total period, the first sub-period and for the second sub-period repectively. Using these sum of the squares in the following equation

$$\frac{SST - (SS1 + SS2) / k}{(SS1 + SS2) / 2 (m-k)}$$

where k = the number of estimated paramters and m is the number of observations in each partition, the resulting ratio is known to follow an F distribution with K and 2(m-k) degrees of freeedom (see J. Johnston, Econometric Methods, Second Edition, McGraw-Hill, 1972, pp. 192-198). If the computed F ratios is not statistically significant, then the estimated parameters (intercept and slope) are jointly stable or homogenous over time. For our analysis, the computed F statistics are shown in Appendix B that follows.

APPENDIX B

Firms in the Switch and Control Samples and Their F-Statistics Testing for the Stationarity of the Market Model Estimates

Firms Switched to LIFO				Control (Firms did not switch to LIFO			
Firm #	S	Name	F-Stat.	Firm #	S	Name	F-Stat.
1	L	A M F Inc.	0.26	1	H	Crompton Knowles	0.17
2	H	Allegheny Ludlum	1.05	2	H	Florida Steel	0.27
3	H	Allied Chemical	2.95	3	H	Chesebrough Ponds	0.01
4	H	American Can Corp.	0.34	4	H	Minnesota Mining & M.	1.12
5	H	American Chain & Cable	0.82	5	H	Keyston Cons.	1.7
6	H	American Stand.	1.03	6	H	Am. Air Filter	1.24
7	H	Amfac Inc.	2.48	7	H	Murphy (GC)	0.36
8	H	Anchor Hocking	0.52	8	L	Puerto Rican Cem.	2.24
9	H	Armstrong Cork	0.13	9	H	Belding Heminway	0.2
10	H	Associated Springs	0.67	10	H	Ptt. Forging	1.3
11	H	Athlone Indus.	0.7	11	H	Jantzen Inc.	0.41
12	L	Avon Products	1.0	12	H	Revlon	0.53
13	H	Bausch & Lomb	0.43	13	L	Bell & Howell	0.52
14	H	Bearings Inc.	0.61	14	H	Bard (CR) Inc.	1.3
15	H	Bethlehem Steel	2.02	15	H	Washington Steel	0.04
16	H	Bliss & Laughlin	0.146	16	H	Omark Inc.	1.09
17	L	Borg Warner Co.	0.7	17	H	Cincinnati Milacron	1.73
18	H	Brockway Glass	1.15	18	H	P P G Inds.	0.21
19	L	Budd Co.	0.34	19	L	Sheller Globe	2.24
20	H	Burlington Inds.	0.73	20	H	J. P. Stevens	1.8
21	H	Carborundum Co.	0.06	21	H	Raybestos Manhattan	0.99
22	H	Celaneze Corp.	2.79	22	H	National Chem. Res.	1.12
23	L	Cenco Inc.	0.11	23	H	GCA Corp.	0.34
24	H	Chemetron Corp	2.79	24	H	Oakite Products	0.34
25	H	Combustion Eng.	0.12	25	H	Indeal Basic	0.63
26	H	Commercial Solv.	0.67	26	H	Molycorp Inc.	0.31
27	L	Continental Oil Co.	0.84	27	H	Skelly Oil	0.90
28	H	Cooper Inds.	0.63	28	H	Allis Chalmers	0.31
29	L	Cooper Tire & R.	2.87	29	L	A P L Corp.	1.01
30	L	Copeland Corp.	0.54	30	H	Dymo Ind.	0.42
31	L	Corning Glass Wor.	2.42	31	L	Owens Corning Fiber.	0.15
32	H	Crown Zellerbach	0.24	32	H	Inter. Paper	1.06
33	H	Cummings Engine	0.28	33	H	Foster Wheeler	1.3
34	H	Dexter Corp	1.33	34	H	National Starch & Ch.	1.6
35	H	Diamond Intl. Cor.	0.78	35	H	Jostins Inc.	0.03
36	H	Donnelly (RR) & S.	1.63	36	L	Simplicity Patterns	1.47
37	H	Dresser Inds.	2.81	37	H	Black & Decker	0.34
38	L	Du Pont	1.91	38	H	Sherwin Williams	0.23
39	L	Eastman Kodak	0.11	39	H	Hunt Philip Chem.	0.33
40	H	Ethyl Corp.	0.84	40	H	Cabot Corp.	0.43

Appnedix B Continued

41	H	F M C Corp.	0.79	Skil Corp	0.48
42	L	Federal Mogul Corp.	0.05	Acme-Cleveland	1.82
43	H	Ferro Corp.	0.01	Amerace Cprp.	2,16
44	H	Fieldcrest Mills	0.21	Hanes Corp.	0.26
45	H	Firestone Tire & R.	0.74	Uniroyal	0.91
46	H	Fisher Foods Inc.	0.31	Mumford Inc.	0.16
47	L	Flinkote Co.	0.29	Pasco Inc.	1.54
48	H	Foxboro Co.	0.64	Robertshaw Ctls.	1.10
49	H	G A F Corp.	1.4	Texas Indus. Inc.	0.98
50	L	Gardner Denver	0.11	Smith International	2.16
51	H	Georgia Pacific Corp	1.2	Champion Intl.	0.30
52	H	Goodrich (BF) Co.	0.93	Dayco Corp.	3.07
53	H	Grace (WR) & Co.	0.68	Baxter Lab.	0.62
54	H	Grantiville Co.	0.66	Collins & Aikman	0.23
55	H	Hammermill Paper Co.	0.24	Potlatch	0.11
56	H	Hercules Inc.	0.43	The Smithkline	1.46
57	H	Hoffman Elect. Corp.	0.17	Kiddie Walter	1.48
58	H	Howmet Corp.	1.21	Kawecki Brylco Inds.	0.34
59	H	Ingersoll Rand Co.	1.78	Dorr Oliver	1.4
60	H	Kaiser Aluminum	1.34	Fansteel Inc.	2.04
61	H	Kennecott Copper	0.84	Hudson Bay	1.5
62	H	Kimberly Clark Corp	0.36	Avery Products	1.4
63	H	Koppers Inc.	1.07	N L Industries Inc.	0.6
64	H	Leesona Corp.	2.13	Harris Corp. (Del)	0.8
65	L	Lehigh Portland Cem.	1.2	Lone Star Inds. Inc.	2.27
66	L	Libbey-Owens-Ford	0.01	Amcord Inc.	3.94
67	H	Lukens Steel Co.	1.3	General Signal Co.	0.98
68	H	Mallory (RR) & Co.	0.52	CTS Corp	1.34
69	H	Marcor Inc.	0.15	Liberty Corp.	0.17
70	L	Maremont Corp	2.37	Quester Corp.	0.06
71	H	Martin Marietta Corp	0.78	ACF Inds.	0.23
72	H	Maryland Cup Corp.	0.58	Hoerner Waldorf	0.05
73	L	McGraw Edison Co.	0.22	Sunbeam Corp.	1.11
74	H	McNeil Corp.	0.11	USM Corp.	0.78
75	L	Medusa Corp	0.47	Marquette	0.56
76	H	Microdot Inc.	2.81	Burndy Inc.	2.1
77	L	Mohasco Corp.	0.36	Lowenstein (M) & Sons	0.78
78	L	National Presto Inds.	2.341	Gillette	0.39
79	L	Norris Inds.	0.44	Scoville Mfg.	0.11
80	H	Norton Co.	0.82	Johns Manville	0.79
81	H	Occidental Pet. Corp.	1.72	Texas Oil & Gas	0.98
82	H	Owens Illinois Inc.	0.16	Giant Portland Cement	0.14
83	H	Penwalt Corp.	0.82	Miles Lab.	0.14
84	H	Peter Paul Inc.	0.95	Tootsie Roll Inds.	0.16
85	H	Pfizer	2.3	Schering Plough	0.69
86	L	RCA Corp	0.7	Int. Tel. & Tel.	0.66
87	H	Reynolds Metals	0.5	Rvere Copper & Brass	0.65
88	H	Rohm & Haas	1.06	Foremost McKesson	0.39
89	H	St. Regis Paper	0.33	Meade Corp.	0.54
90	H	Scott Paper Co.	0.12	Boise Cascade	0.32
91	H	Signode	0.23	Diebold	1.82
92	L	Smith (AO) Corp.	1.21	Eaton Corp.	0.64

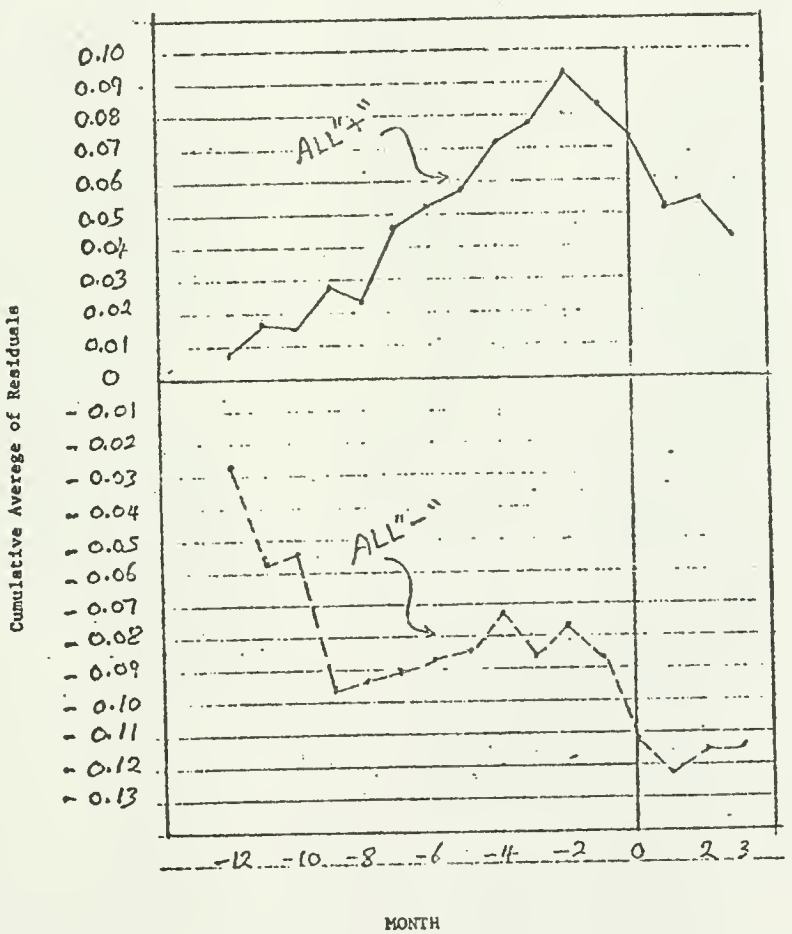
Appendix B Continued

93	L	St. Oil Co. of Cal	0.45	93	H	Atlantic Richfield	1.6
94	H	Standard Pressed co.	0.98	94	H	Masco	0.68
95	H	Stone Container	1.41	95	H	Fiberboard Corp.	2.85
96	H	TRW Inc.	0.5	96	H	Arvin Inds.	0.91
97	H	UMC Inds.	1.39	97	H	Culligan Intl.	0.07
98	H	Unarco Inds.	1.6	98	H	Midland Ross	0.05
99	L	U S Gypsum	0.19	99	L	Kaiser Cement & Gyps.	0.99
100	H	Varian Associates	0.81	100	H	Raytheon Co.	0.07
101	L	Wallace Murray	0.30	101	L	Monogram Inds.	1.65
102	L	Weatherhead	0.92	102	H	Houdaille Inds.	0.38
103	H	Wheeling Pitt. Steel	1.38	103	H	Continental Copper & St	1.57
104	L	Whirlpool	0.39	104	H	General Electric	0.72
105	L	Woods Corp.	1.12	105	H	Transamerica Corp	2.3
106	H	Youngstown Steel	0.64	106	H	Babcock & Wilcox	0.77
107	L	Carrier Corp.	1.6	107	L	Vendo	0.2

*F is significant at the 0.05 level if it exceeds 3.07.
S = the sign of the direction of expected growth in EPS, H = + and L = - .

Appendix C

In this appendix, we present an evidence on the strength of the direction of forecasted earnings per share in explaining the variation of cumulative average residuals in the rates of return on investing in common stocks. Both samples in the study (experimental and control) were pooled and the variables of interest here was the sign of forecasted change in earnings per share. Because the number of firms whether switched or not with a "+" was 161 and the number of firms with a "-" sign was 53, the data should be interpreted with care. Figure C-1 shows the results of charting the behavior of cumulative average of residuals for each group. The behavior of these series indicate that firms with a positive forecast sign is likely to earn higher rate of return than firms with a negative forecast sign. Since our interest in this paper was not directed to the question of the value of forecasts per se, we provide the chart below as a supportive evidence for the use of the forecasted sign of growth in EPS as a joint variable for analysis of the effects of accounting change. Other evidence is provided by Patell (1976), Gonedes et al (1976), Foster (1973) and others not cited here.



(Month 0 is the month of switching to LIFO)

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